

WHAT IS CLAIMED IS:

- 1 1. A method of writing data, comprising:
2 storing a first record in a disk storage unit wherein said first record includes an
3 indication that a stripe of user data and parity data stored across a plurality of disk storage
4 units potentially contains a parity inconsistency;
5 writing user data and parity data in said stripe indicated by said record; and
6 clearing said indication.
- 1 2. The method of claim 1 wherein said first record contains a plurality of
2 indications for a plurality of stripes across said plurality of disk storage units, that said
3 plurality of stripes each potentially contains a parity inconsistency.
- 1 3. The method of claim 2 wherein said plurality of disk storage units are
2 arranged in a Redundant Array of Independent Disks type organization.
- 1 4. The method of claim 3 wherein each indication includes an identification of
2 the stripe being indicated and wherein each identification includes a Redundant Array of
3 Independent Disks organization volume number and stripe number .
- 1 5. The method of claim 1 further comprising:
2 receiving from a first plurality of write processes in a first accumulation period, a
3 plurality of indications wherein each indication from a write process indicates that a
4 destination stripe across said plurality of disk storage units, associated with the write
5 process, potentially contains a parity inconsistency; and
6 storing in response to said plurality of indications from said first plurality of write
7 processes, in a second record a plurality of indications wherein each indication of said
8 second record indicates that a destination stripe of said first plurality of write processes
9 potentially contains a parity inconsistency.

1 6. The method of claim 5 further comprising receiving a flush instruction from a
2 first write process of said first plurality of write processes and in response to said flush
3 instruction, writing said second record to a disk storage unit.

1 7. The method of claim 6 further comprising sending, upon completion of said
2 writing of said second record to a disk storage unit, a record write completion indication
3 to each write process of said first plurality of write processes.

1 8. The method of claim 7 wherein a second write process of said first plurality of
2 write processes writes user data and parity data in the destination stripe associated with
3 the second write process, in response to the second write process receiving a record write
4 completion indication, and sends a mark clean instruction for the destination stripe
5 associated with the second write process..

1 9. The method of claim 8 further comprising receiving a mark clean instruction
2 from the second write process of said first plurality of write processes and in response to
3 said mark clean instruction, removing from said second record an indication that the
4 destination stripe associated with the second write process potentially contains a parity
5 inconsistency.

1 10. The method of claim 9 further comprising:
2 in response to said flush instruction, writing said second record to a flush record;
3 receiving a second flush instruction from a third write process of said first
4 plurality of write processes; and
5 determining if the second record containing an indication that a destination stripe
6 associated with said third write process potentially contains a parity inconsistency, has
7 already been written to a disk storage unit.

1 11. The method of claim 9 further comprising:
2 receiving from a second plurality of write processes after said flush instruction, a
3 second plurality of indications wherein each indication from a write process indicates
4 that a destination stripe across said plurality of disk storage units, associated with the
5 write process, potentially contains a parity inconsistency; and
6 storing in response to said plurality of indications from said second plurality of
7 write processes, in said second record a second plurality of indications wherein each
8 indication of said second plurality of indications of said second record indicates that a
9 destination stripe of said second plurality of write processes potentially contains a parity
10 inconsistency.

1 12. The method of claim 11 further comprising receiving a third flush instruction
2 from a first write process of said second plurality of write processes and in response to
3 said third flush instruction, writing said second record to a disk storage unit, wherein said
4 clearing said indication includes writing said second record to a disk storage unit in
5 which the indication that the destination stripe associated with the second write process
6 potentially contains a parity inconsistency has been removed.

1 13. The method of claim 12 wherein the first record is stored with a first
2 generation number in a first disk storage unit and the second record is stored with a
3 second generation number in a disk storage unit different from the first disk storage unit.

1 14. An article comprising a storage medium, the storage medium comprising
2 machine readable instructions stored thereon to:
3 store a first record in a disk storage unit wherein said first record includes an
4 indication that a stripe of user data and parity data stored across a plurality of disk storage
5 units potentially contains a parity inconsistency;
6 write user data and parity data in said stripe indicated by said record; and
7 clear said indication.

1 15. The article of claim 14 wherein said first record contains a plurality of
2 indications for a plurality of stripes across said plurality of disk storage units, that said
3 plurality of stripes each potentially contains a parity inconsistency.

1 16. The article of claim 15 wherein said plurality of disk storage units are
2 arranged in a Redundant Array of Independent Disks type organization.

1 17. The article of claim 16 wherein each indication includes an identification of
2 the stripe being indicated and wherein each identification includes a Redundant Array of
3 Independent Disks organization volume number and stripe number .

1 18. The article of claim 14 wherein the storage medium further comprises
2 machine readable instructions stored thereon to:
3 receive from a first plurality of write processes in a first accumulation period, a
4 plurality of indications wherein each indication from a write process indicates that a
5 destination stripe across said plurality of disk storage units, associated with the write
6 process, potentially contains a parity inconsistency; and
7 store in response to said plurality of indications from said first plurality of write
8 processes, in a second record a plurality of indications wherein each indication of said
9 second record indicates that a destination stripe of said first plurality of write processes
10 potentially contains a parity inconsistency.

1 19. The article of claim 18 wherein the storage medium further comprises
2 machine readable instructions stored thereon to receive a flush instruction from a first
3 write process of said first plurality of write processes and in response to said flush
4 instruction, write said second record to a disk storage unit.

1 20. The article of claim 19 wherein the storage medium further comprises
2 machine readable instructions stored thereon to send, upon completion of said writing of
3 said second record to a disk storage unit, a record write completion indication to each
4 write process of said first plurality of write processes.

1 21. The article of claim 20 wherein the storage medium further comprises
2 machine readable instructions stored thereon for a second write process of said first
3 plurality of write processes to write user data and parity data in the destination stripe
4 associated with the second write process, in response to the second write process
5 receiving a record write completion indication, and to send a mark clean instruction for
6 the destination stripe associated with the second write process..

1 22. The article of claim 21 wherein the storage medium further comprises
2 machine readable instructions stored thereon to receive a mark clean instruction from the
3 second write process of said first plurality of write processes and in response to said mark
4 clean instruction, remove from said second record an indication that the destination stripe
5 associated with the second write process potentially contains a parity inconsistency.

1 23. The article of claim 22 wherein the storage medium further comprises
2 machine readable instructions stored thereon to:
3 in response to said flush instruction, write said second record to a flush record;
4 receive a second flush instruction from a third write process of said first plurality
5 of write processes; and
6 determine if the second record containing an indication that a destination stripe
7 associated with said third write process potentially contains a parity inconsistency, has
8 already been written to a disk storage unit.

1 24. The article of claim 22 wherein the storage medium further comprises
2 machine readable instructions stored thereon to:
3 receive from a second plurality of write processes after said flush instruction, a
4 second plurality of indications wherein each indication from a write process indicates
5 that a destination stripe across said plurality of disk storage units, associated with the
6 write process, potentially contains a parity inconsistency; and
7 store in response to said plurality of indications from said second plurality of
8 write processes, in said second record a second plurality of indications wherein each

9 indication of said second plurality of indications of said second record indicates that a
10 destination stripe of said second plurality of write processes potentially contains a parity
11 inconsistency.

1 25. The article of claim 24 wherein the storage medium further comprises
2 machine readable instructions stored thereon to receive a third flush instruction from a
3 first write process of said second plurality of write processes and in response to said third
4 flush instruction, write said second record to a disk storage unit, wherein said clearing
5 said indication includes writing said second record to a disk storage unit in which the
6 indication that the destination stripe associated with the second write process potentially
7 contains a parity inconsistency has been removed.

1 26. The article of claim 25 wherein the first record is stored with a first
2 generation number in a first disk storage unit and the second record is stored with a
3 second generation number in a disk storage unit different from the first disk storage unit.

1 27. A system, comprising:
2 at least one memory which includes an operating system and an
3 application;
4 a processor coupled to the memory;
5 data storage having a plurality of disk storage units;
6 a data storage controller for managing Input/Output (I/O) access to the
7 data storage; and
8 a device driver executable by the processor in the memory, wherein at
9 least one of the application, operating system, and device driver is adapted to:
10 store a first record in a disk storage unit wherein said first record includes an
11 indication that a stripe of user data and parity data stored across said plurality of disk
12 storage units potentially contains a parity inconsistency;
13 write user data and parity data in said stripe indicated by said record; and
14 clear said indication.

1 28. The system of claim 27 wherein said first record contains a plurality of
2 indications for a plurality of stripes across said plurality of disk storage units, that said
3 plurality of stripes each potentially contains a parity inconsistency.

1 29. The system of claim 28 wherein said plurality of disk storage units are
2 arranged in a Redundant Array of Independent Disks type organization.

1 30. The system of claim 29 wherein each indication includes an identification of
2 the stripe being indicated and wherein each identification includes a Redundant Array of
3 Independent Disks organization volume number and stripe number .

1 31. The system of claim 27, wherein said at least one of the application, operating
2 system, and device driver is further adapted to:

3 receive from a first plurality of write processes in a first accumulation period, a
4 plurality of indications wherein each indication from a write process indicates that a
5 destination stripe across said plurality of disk storage units, associated with the write
6 process, potentially contains a parity inconsistency; and

7 store in response to said plurality of indications from said first plurality of write
8 processes, in a second record a plurality of indications wherein each indication of said
9 second record indicates that a destination stripe of said first plurality of write processes
10 potentially contains a parity inconsistency.

1 32. The system of claim 31 wherein said at least one of the application, operating
2 system, and device driver is further adapted to receive a flush instruction from a first
3 write process of said first plurality of write processes and in response to said flush
4 instruction, write said second record to a disk storage unit.

1 33. The system of claim 32 wherein said at least one of the application, operating
2 system, and device driver is further adapted to send, upon completion of said writing of
3 said second record to a disk storage unit, a record write completion indication to each
4 write process of said first plurality of write processes.

1 34. The system of claim 33 wherein said at least one of the application, operating
2 system, and device driver is further adapted for a second write process of said first
3 plurality of write processes to write user data and parity data in the destination stripe
4 associated with the second write process, in response to the second write process
5 receiving a record write completion indication, and to send a mark clean instruction for
6 the destination stripe associated with the second write process..

1 35. The system of claim 34 wherein said at least one of the application, operating
2 system, and device driver is further adapted to receive a mark clean instruction from the
3 second write process of said first plurality of write processes and in response to said mark
4 clean instruction, remove from said second record an indication that the destination stripe
5 associated with the second write process potentially contains a parity inconsistency.

1 36. The system of claim 35 wherein said at least one of the application, operating
2 system, and device driver is further adapted to:
3 in response to said flush instruction, write said second record to a flush record;
4 receive a second flush instruction from a third write process of said first plurality
5 of write processes; and
6 determine if the second record containing an indication that a destination stripe
7 associated with said third write process potentially contains a parity inconsistency, has
8 already been written to a disk storage unit.

1 37. The system of claim 35 wherein said at least one of the application, operating
2 system, and device driver is further adapted to:
3 receive from a second plurality of write processes after said flush instruction, a
4 second plurality of indications wherein each indication from a write process indicates
5 that a destination stripe across said plurality of disk storage units, associated with the
6 write process, potentially contains a parity inconsistency; and
7 store in response to said plurality of indications from said second plurality of
8 write processes, in said second record a second plurality of indications wherein each

9 indication of said second plurality of indications of said second record indicates that a
10 destination stripe of said second plurality of write processes potentially contains a parity
11 inconsistency.

1 38. The system of claim 37 wherein said at least one of the application, operating
2 system, and device driver is further adapted to receive a third flush instruction from a first
3 write process of said second plurality of write processes and in response to said third
4 flush instruction, write said second record to a disk storage unit, wherein said clearing
5 said indication includes writing said second record to a disk storage unit in which the
6 indication that the destination stripe associated with the second write process potentially
7 contains a parity inconsistency has been removed.

1 39. The system of claim 38 wherein the first record is stored with a first
2 generation number in a first disk storage unit and the second record is stored with a
3 second generation number in a disk storage unit different from the first disk storage unit.